

AG Contract No.: KR00-2306TRN
ADOT ECS File: JPA 00-193 **Amendment**
Project: SPR-473/R0473 08P
Scope: Advanced Snowplow
Evaluation Program

AMENDMENT ONE
AGREEMENT
BETWEEN
THE ARIZONA DEPARTMENT OF TRANSPORTATION
AND
THE ARIZONA BOARD OF REGENTS
ACTING FOR AND ON BEHALF OF
NORTHERN ARIZONA UNIVERSITY

THIS AGREEMENT of Amendment to JPA 00-193, AG Contract No.: KR00-2306TRN, signed 5 December, 2000, is entered into April 2nd, 2002, between agencies of the STATE OF ARIZONA, to wit; the DEPARTMENT OF TRANSPORTATION (the "DOT") and the ARIZONA BOARD OF REGENTS acting for and on behalf of the NORTHERN ARIZONA UNIVERSITY (NAU), (the "University")

I. RECITALS

1. The DOT is empowered by Arizona Revised Statutes Section 28-401 to enter into this agreement and has by resolution, a copy of which is attached hereto and made a part hereof, resolved to enter into this agreement and has delegated to the undersigned the authority to execute this agreement on behalf of the DOT.

2. The University is empowered by Arizona Revised Statutes Section 15-1626 to enter into this agreement and has by Policy BOR 3-103, a copy of which is attached hereto and made a part hereof, authority to execute this agreement on behalf of the University.

3. The DOT and the University desire to conduct an additional year, of analysis for DOT's Advanced Snowplow Research Program (SPR 473) for the winter of 2001 – 2002, at an additional cost to the DOT of \$18,863.00, hereinafter referred to as the Project.

All terms and conditions of the original Agreement remain the same, except as changed herein.

THEREFORE, in consideration of the mutual covenants expressed herein, JPA 00-193 is amended and agreed to as follows:

II. SCOPE OF WORK

Under II.1. the State will, d. is added to read as follows:

d. Reimburse the University within forty-five (45) days after receipt and approval of monthly invoices, in a total amount currently estimated at \$18,863.00, for the additional 2001-2002 Evaluation Program Tasks, as shown on Exhibit C, attached hereto and made a part hereof.

Under II.2. the University will, d and e. be added as follows:

d. Perform the additional research and development goals and objectives of the Project, including the development of a final report documenting by the date stipulated in the Letter Amendment of September 30, 2002.

e. Continue to submit monthly invoices to the DOT, an amount currently estimated at \$18,863.00, for the additional 2001-2002 Evaluation Program Tasks, as shown on Exhibit C

III. MISCELLANEOUS PROVISIONS

1. Miscellaneous Provisions in the original Agreement remains in full force and effect
2. This agreement shall become effective upon signature by the parties hereto, and shall remain in force and effect until completion of said Project and reimbursements; provided, however, that this agreement, may be cancelled at any time prior to the commencement of performance under this agreement, upon thirty (30) days written notice to the other party.
3. The parties agree to comply with all applicable state and federal laws, rules, regulations and executive orders governing equal employment opportunity, immigration, nondiscrimination and affirmative action
7. All notices or demands upon any party to this agreement shall be in writing and shall be delivered in person or sent by mail addressed as follows:

Arizona Department of Transportation
Joint Project Administration
205 South 17 Avenue, Mail Drop 616E
Phoenix, AZ 85007
Phone: (602) 712-8088]
fax: (602) 712-7424
lgrandacre@dot.state.az.us

Northern Arizona University
Office of Grant and Contract Services
NAU Box 4130
Flagstaff, AZ 86011-4130

IN WITNESS WHEREOF, the parties have executed this agreement the day and year first above written

STATE OF ARIZONA

NORTHERN ARIZONA UNIVERSITY

DEPARTMENT OF TRANSPORTATION

By Wilma G. Ennenga 3/28/02

Wilma G. Ennenga, Director
Office of Grant and Contract Services

By Mary Lynn Tischler
MARY LYNN TISCHER, Director
Transportation Planning Division

AMENDMENT ONE

RESOLUTION

BE IT RESOLVED on this 8th day of February 2002, that I, the undersigned VICTOR M. MENDEZ, as Director of the ARIZONA DEPARTMENT OF TRANSPORTATION, have determined that it is in the best interests of the STATE OF ARIZONA that the DEPARTMENT OF TRANSPORTATION, acting by and through the TRANSPORTATION PLANNING DIVISION, to enter into an agreement with the ARIZONA BOARD OF REGENTS, acting for and on behalf of NORTHERN ARIZONA UNIVERSITY, for the purpose of amending the agreement JPA 00-193 to conduct an additional year, of analysis for DOT's Advanced Snowplow Research Program (SPR 473) for the winter of 2001 – 2002, at an additional cost to the DOT of \$18,863.00

Therefore, authorization is hereby granted to draft said agreement which, upon completion, shall be submitted to the Director of Transportation Planning Division or higher, for approval and execution.

A handwritten signature in black ink, reading "Mary Lynn Tischer", is written over a horizontal line.

MARY LYNN TISCHER
Transportation Planning Division Director

for VICTOR M. MENDEZ, Director

Budget for 2001-2002 Evaluation Program Tasks dtd 1/10/02

Revision of 1/9/02

AZTrans: The Arizona Laboratory for Applied Transportation Research
Northern Arizona University; Department of Civil and Environmental Engineering

Advanced Snowplow Evaluation Project

ADOT ECS File: JPA 00-193

Revision of Contract to Include Additional Work for Snow Season 2001-2002

2001-2002 Evaluation Program Tasks

During the Winter 2001-2002 testing season, with support from the ATRC and the project TAC, the Consultant will perform the project tasks listed below

1. Attend project Technical Advisory Committee (TAC) meetings, two hours in length, held roughly every six weeks. During the testing season, assume four meetings, all in Flagstaff.
2. Collaborate with ADOT on the development of enhanced evaluation survey instruments. Receive first and second-tier evaluations from ADOT from participating plow operator-trainees and Team Leader Activity Reports. Conduct ride-alongs during training. Review, analyze and summarize this data for the test program. Consult with CALTRANS and various vendors, as needed. During this 2001-2002 Winter season, it is anticipated that emphasis will be placed on evaluations of the Collision Warning System (CWS) and the Advanced Vehicle Location (AVL) system as well as direct comparison between the complete 3M and CALTRANS Advanced SnowPlow Systems (ASPs). Additionally a Night Vision Device is scheduled to be tested in a snowplow and operator feedback on this system will be evaluated.
3. Following one or more major winter storm events, receive AVL data and conduct interviews with snowplow operators, their org supervisor(s), their district superintendent(s), and their district maintenance engineer(s). Conduct ride-alongs during winter operations. From this data, synthesize or "reconstruct" the storm event(s). Evaluate the ability of the AVL technology to reconstruct such storm events and what operational value this may have to snowplow operators, supervisors, superintendents, and maintenance engineers.
4. In the Winter 2000-2001 evaluation work, a "Management Survey" was conducted. In this survey a very rough estimate was made of the statewide deployment costs for an ASP system. A new survey instrument will be designed and sent to each ADOT District to gather better data from which to make a deployment cost estimate. This data will be analyzed and new estimates of statewide ASP system deployment costs made.
5. Produce a written Evaluation Task Report, summarizing all of the above activities and relevant information. Report evaluation goals, activities, conditions, issues, interview inputs, overall results and recommendations for the winter test program. This evaluation report will be written such that it can be either a stand-alone report or included as a chapter in the future ADOT-ATRC research project report describing this year's ASP program.
6. Make a summary evaluation project presentation to the TAC.

Attachment A

Arizona ASP Test Program Planning Caltrans Advanced Snowplow *and* ADOT-3M Snowplow December 2000 - February 2001

1. 3M System Testing & Evaluation Schedule (November 2000 – March 2001)

- 3M Install, Site Test & Commissioning: *September 26/27 - ***done**
- Core Staff / Team Leader Training by 3M: *September 27/28 - ***done**
- Planned AVL and Radar Systems Install: November (dates to be confirmed)
- LTAP Snow Control Conference (Pinetop): November 8 / 9 – w/ 3M and Logistixx
- **Student Operator Training & Evaluation: Late November and December**
- Long-Term Field Evaluation - From November onward
- Phases of Evaluation (?) - Early Winter vs. Late Winter
- Demo Day (?) - **TBD**

2. 3M System - T&E Workplan – Project Goals and Tasks

- Confirm Snowplow System is Operational – Care & Maintenance Procedures - ***done**
- Confirm Infrastructure Conditions at Test Site / Resolve Striping Issues - ***done**
- Concurrent Evaluation of Peripheral Systems – Radar and AVL
- Training of & Evaluations by Team Leaders - ***training by 3M and TL Self-Training**
- Training of & Evaluations by (20?) Student Operators – 3 Districts – 5-day weeks
- Long-Term District Evaluation – Gray Mountain Maint Yard - Use Plow on US 89
- Test site: Sunset Crater area – US 89 Northbound Lanes MP 428 to 433
- Full Snowplow Route – East Flagstaff to Antelope Hills (US 89 MP's 418 - 440)
- Demo Day – Local Agencies / Community Relations / Media (??-waiver issues)

3. Caltrans Testing & Evaluation Schedule (February 5 / March 2, 2001)

- Initial Site Testing & Commissioning: February, Week 1 (M – W)
- Initial Training – Core Staff / Team Leaders: Week 1 (M – W)
- Student Operator Training & Evaluation: Weeks 1 & 2: Feb 5 → 16
- Long-Term Field Evaluation - Weeks 3 and 4
- Demo Day (?) - **TBD**

4. Caltrans T&E Workplan – Goals and Tasks

- Accept Snowplow from Caltrans Staff – Confirm Care & Maintenance Procedures
- Installation of Spare ADOT Radio – by DPS Radio Shop – Coordination by District
- Confirm Infrastructure Conditions at Test Site – Field Repairs or Changes
- Training of & Evaluations by Team Leaders
- Training & Evaluations by Stakeholder Operators – 3 Districts – same group as w/ 3M
- Long-Term District Evaluation – Flagstaff Maint Yard - Use Caltrans Plow on US180
- Full Snowplow Route – MP 215 (Flagstaff) to MP 250
- Test Site at Kendrick Park – Both directions, MP 235 to 238
- Demo Day – Local Agencies / Community Relations / Media (??-waiver issues)

5. Snowplow Project Workplan 00-01: Partners Goals and Elements

5a. Caltrans Goals:

- To Test and Document Upgraded Systems & Displays in AZ Conditions - - -
 - With ADOT Winter Maintenance Operating Practices
 - With Independent Pool of Skilled ADOT Operators
 - With Two-Lane Roadway – Oncoming Traffic & Shoulder Obstacles

5b. 3M Corp Goals:

- To Test and Document Commercial Systems & Displays in AZ Conditions - - -
 - With ADOT Winter Maintenance Operating Practices
 - With Independent Pool of Skilled ADOT Operators
 - With Two-Lane Roadway – Oncoming Traffic & Shoulder Obstacles
 - *Marketing / Outreach to Local and Regional Agencies*

5c. ADOT Goals:

- Operator Training – Skills, Acceptance Level, Learning Curve, Perceived Benefit
- Operator Contributions – Comments and Suggestions reflecting ADOT Perspectives
- Impartial third-Party Evaluation – Northern Arizona University or Consultant
- Evaluate Each ASP System - Efficiency & Safety Measurements vs Cost to Deploy
- Evaluate Durability and Reliability of Each Unique Infrastructure
- Evaluate 3rd-Party Commercial GPS Vehicle Tracking System (AVL)
- Evaluate 3rd-Party Commercial Vehicle Radar System (CWS)
- Technology Transfer Within Agency – Other Districts and Divisions
- Advisory and Demonstration to Other Partner Agencies

Attachment B

sample

Advanced Snowplow Evaluation Questionnaire Caltrans Advanced Snowplow - 1999/2000

We would like to ask you some questions regarding your opinion of the driver assist system. We will not be recording your identity and this information will not be associated with you or be used as a means of evaluating your performance. We are only interested in evaluating the system. We may share this with Caltrans/Arizona DOT.

Your participation is voluntary. You are free to refuse to take part. You may refuse to answer any question and may stop taking part in the study at any time. Whether or not you participate in this research will have no bearing on your standing in your job.

How long have you been driving snowplows?

How much time have you logged on the Advanced Snowplow?

For the following questions, please circle the number of your choice:

1) How easy is the system to use overall?

(Not easy at all) 1 2 3 4 5 (Very easy)

2) How much do you like the system overall?

(Not at all) 1 2 3 4 5 (A lot)

3) If you had more time to practice with the system, would you like it more?

(No) 1 2 3 4 5 (Yes)

4) Please rate the potential of the system to improve your safety:

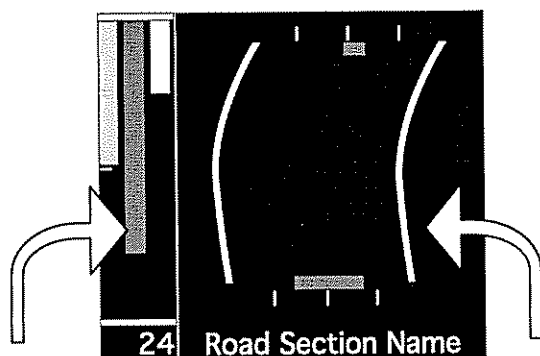
(Not at all) 1 2 3 4 5 (A lot)

5) Please rate the potential of the system to improve your efficiency:

(Not at all) 1 2 3 4 5 (A lot)

Please answer the questions on the back/next page.

For each component (Collision Warning, Lane Keeping):



Collision Warning

How easy is this component to use?

(Not easy at all) 1 2 3 4 5 (Very easy)

How much do you like this component?

(Not at all) 1 2 3 4 5 (A lot)

Comments:

Lane Keeping

How easy is this component to use?

(Not easy at all) 1 2 3 4 5 (Very easy)

How much do you like this component?

(Not at all) 1 2 3 4 5 (A lot)

Comments:

How long do you think you would need to become comfortable with this system?

Please draw or describe what you feel would be an ideal display:

Attachment C - sample**US 180 SNOWPLOW TESTING RECORD / OPERATOR EVALUATION****Site: US 180 – MP 235.0 -> 238.0 (Kendrick Park Test Lane)**

Date: _____ Time Start: _____ Time End: _____
 Name: _____ Org No: _____ Org Name: _____

**** SITE CONDITIONS DURING TESTING ****

	235.0 – 235.5 NB	235.5 – 237.0 NB	237.0 – 238.0 NB	238.0 – 237.0 SB – Return
CONDITIONS (check all that apply)	Hart Prairie	Kendrick Park	Steep Downgrade	Steep Upgrade
Wind (Speeds?)				
Snow Falling				
Sunny				
Cloudy				
Dark				
VISIBILITY				
Zero				
50 feet				
100				
200				
300				
Over 300 feet				
ROAD COVER				
Snowpack / Ice				
Slush				
Clear				
ACTIVITY				
Plowing				
Sanding				
Dry Test Run				

Operator's Background: Years of Snowplow Experience: _____ Hours on the Test Plow: _____

Satisfaction with Caltrans Driver-Assistance Systems (10 – best, 1- worst):

1 to 10 Scale - Ease of Use of Automated Systems: _____

1 to 10 Scale - Potential to Improve YOUR Safety: _____

1 to 10 Scale - Potential to Improve Your Efficiency: _____

Lane Position Indicator:

Did this feature Increase your level of safety ?? _____

How often did you look at the display screen? _____

Lane Departure Warning:

Did this feature Increase your level of safety ?? _____

Collision Warning System:

Did this feature Increase your level of safety ?? _____

Displays / Warnings:

Were these features clear and easy to understand? _____

Did the system provide enough information to be useful? _____

Was the system response fast enough to be useful? _____

Comments and Recommendations (please use back of page):

1. Were there any system problems when you were operating the vehicle? (Describe):
2. Did the system ever lead you to make a wrong maneuver or error in judgment?
3. What suggestions would you make to improve any feature's usefulness to you?

Budget for Evaluation Program Workscope dtd 11/1/00

Snowplow Research Project SPR 473

Preliminary Proposal for Evaluation Support 2000-2001

Craig A. Roberts, Ph.D., P.E.

Asst. Prof., Dept. of Civil and Environmental Engineering, NAU, and
Director, AZTrans; The Arizona Laboratory for Applied Transportation Research

Services for Dec. 1, 2000 to June 30, 2001

Labor	Amounts
<i>Faculty-- Craig A. Roberts, P.I.</i>	
Salary: (\$34.21/hr) (3 weeks)(40 hr/wk)	\$4,105
Benefits: 25% of Salary	\$1,026
<i>Undergraduate/Graduate Research Assistants</i>	
Salary: (\$15.00/hr) (10 weeks)(20 hr/wk)	\$2,400
Benefits: 1% of Salary	<u>\$24</u>
<i>subtotal</i>	<u>\$7,556</u>
In State Travel and Misc. Supplies	\$800
Indirect Costs (20% of all costs)	<u>\$1,671</u>
<i>grand total</i>	<u><u>\$10,027</u></u>

Milestones for Evaluation Program Workscope dtd 11/1/00

1. 31 March 2001: Delivery of Preliminary Draft of the "Evaluation Task Report"
2. 30 April 2001: Delivery of Final "Evaluation Task Report"

Revision of 11/15/00



STATE OF ARIZONA

OFFICE OF THE ATTORNEY GENERAL

1275 WEST WASHINGTON, PHOENIX, AZ 85007-2926

JANET NAPOLITANO
ATTORNEY GENERAL

TRN Main: (602) 542-1680
Direct: (602) 542-8855
Fax: (602) 542-3646

MAIN PHONE: (602) 542-5025
FACSIMILE: (602) 542-4085

INTERGOVERNMENTAL AGREEMENT
DETERMINATION

A.G. Contract No. KR00-2306TRN **Amendment**, an agreement between public agencies, has been reviewed pursuant to A.R.S. § 11-952, as amended, by the undersigned Assistant Attorney General who has determined that it is in the proper form and is within the powers and authority granted to the State of Arizona.

No opinion is expressed as to the authority of the remaining parties, other than the State or its agencies, to enter into said agreement.

DATED: February 12, 2002.

JANET NAPOLITANO
Attorney General

SUSAN E. DAVIS
Assistant Attorney General
Transportation Section

SED:ggt

Enc.

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